



State of Utah

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

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November 2, 2000

TO:

[REDACTED]

FROM:

Paul B. Baker, Reclamation Biologist and Project Team Lead

RE:

September 21, 2000, Submittal of Revised Reclamation Plan, PacifiCorp, Deer Creek Mine, A [REDACTED] -AM99C-3

SUMMARY:

On September 21, 2000, the Division received a response to its March 13, 2000, technical analysis of the Deer Creek reclamation plan. This is the third submittal of the reclamation plan.

Neither the application nor the current mining and reclamation plan contains much information about the soils that would be used for reclamation. There is no stockpiled topsoil, and some of the materials that would be used for growth media have high salt levels. The Division needs more information about the soils available in the canyon.

The applicant has adequately addressed most biology issues. The application now includes some detail of soft armoring that would be used in certain parts of the channels, and the revegetation plan needs to be modified to provide for more stable channels.

TECHNICAL ANALYSIS:

OPERATION PLAN

TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-230.

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Analysis:

Topsoil Substitutes and Supplements

Exploration/Sampling Program - Substitute Topsoil

The Deer Creek Mine was developed prior to the Surface Mining Reclamation Control Act (SMRCA) and topsoil was not salvaged or stockpiled during construction and mine development activities. The applicant intends to use construction fills within the disturbance area as substitute topsoil.

The application contains limited information about the substitute soils that would be used for reclamation. Core samples were taken from seven locations and from various depths at each location. These locations are shown on Drawing DS-1810-D. The samples were taken for the purpose of doing stability analyses, so the locations were not necessarily the same as those from which the applicant proposes to gather substitute topsoil. Two samples were taken in the refuse piles, three near some of the highwalls, and two from the fan portal area at the upper end of the disturbed area.

The results of these analyses are in Appendix R645-301-200-C. Samples 1, 2, 3, 4, and 5 had either high sodium adsorption ratio (SAR) or high electrical conductivity (EC) values. Generally, the highest SAR and EC values were in the upper few feet, and, according to verbal information from the applicant's representative, this may be because of salt applications to keep the roads free of ice. High pH readings were found in samples 3 and 6. The upper layers of material near one of the portals had high selenium values. The only site where all samples in the profile met all the Division's criteria for acceptable soils was 2A near the fan.

In addition to these samples taken in 2000, several other samples were taken in 1980 and 1983. These samples were of fill, coal refuse, and slag. Results of analyses on these samples are in the existing mining and reclamation plan, Chapter 4, Tables I and II. With a few exceptions, these samples do not show problems with the physical or chemical characteristics of the fill, but the samples were not analyzed for all the parameters in the Division's *Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mines*. The Division recognizes that the 1980 thru 1983 operational sampling took place prior to the implementation of the 1988 guidelines for topsoil and overburden. However, reclamation standards for soil and overburden are now rated using the 1988 guidelines. Therefore, since sampling did not follow the current 1988 Division guidelines for topsoil and overburden, information in the plan is incomplete and does not show that the fill or refuse materials in Deer Creek and Elk canyons are suitable for achieving the revegetation standards. Further sampling using current guidelines needs to be performed before a determination can be made concerning substitute soil and refuse suitability.

Most of the samples from 1980 and 1983 show little or no problem with EC or SAR values; however, two samples from the parking lot fill slope had EC values of 9.0 (assumed to be $\text{mmhos}\cdot\text{cm}^{-1}$). This could be a result of using salt as discussed above, and the problem may have grown progressively worse to where some of these soils may not now be usable.

The application says a soil exploration/sampling program will be implemented during the operation period of the Deer Creek Mine to determine the extent of substitute topsoil available for reclamation. Samples will be taken by a staff member qualified in collecting soil samples. This will be done along the corridor of the proposed drainage and near the culvert in Deer Creek and Elk Canyons. Appendix A of the Division's *Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mines* will be used as the criteria to determine if the soil is suitable. If suitable soil is not found in the drainage corridor, test plots will be established on a fill slope to test the adaptability of the seed mixture to existing soil conditions. If this fails, the applicant would use a borrow area.

To make a complete determination whether the reclamation plan is acceptable, the Division needs complete laboratory analysis and mass balance data. This information is lacking in both the current plan and in the application. The chemical analyses in the plan indicate there could be some problems with substitute soil materials, but it is not certain.

The commitment in the application to have a sampling program during operations is acceptable, but the applicant needs to be actively working toward gathering enough information to fully develop the reclamation plan. In addition, as substitute soils are identified, these resources need to be protected so they are not contaminated with salts or other materials.

The Division recognizes the difficulty of developing the soils reclamation plan with the available information and that it will take some time to take and analyze samples and to make necessary changes to the backfilling and grading plan. In lieu of the applicant providing all this information now, the Division would accept a schedule showing when and approximately where samples will be taken. The samples should be taken and analyzed as soon as reasonably possible which the Division expects would be by the summer of 2001. They should be taken from the areas where the applicant anticipates salvaging substitute topsoil materials. The applicant should also commit to inform the Division a few days in advance of taking the samples. Having a Division representative on site during sampling protects the applicant and helps the Division interpret sample results.

In the reclamation section of the existing mining and reclamation plan are the headings "Interim Vegetation Establishment" and "Fill Slopes." This section discusses interim revegetation efforts on fill slopes at the equipment yard and run of mine conveyor. The plan says the interim vegetation plan will provide the basis for developing final revegetation plan by testing revegetation techniques and plant species. Another purpose for this interim revegetation plan is to develop the fill material as a substitute for topsoil by establishing a root system in the top

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layers along with organic material buildup and an environment suitable for microorganism colonization.

Commitment 7 in the maintenance and monitoring section of the interim revegetation section of the plan says the soil materials on the fill slopes will be sampled at five year intervals. Because development of these soils is part of the reclamation plan, results of these analyses need to be included in the application.

Exploration/Sampling Program - Refuse Piles

Appendix R645-301-200-C contains analyses of two core samples from the refuse piles, one from Deer Creek Canyon and one from Elk Canyon. The analyses of the Deer Creek Canyon refuse, site 1 on Drawing DS-1810-D, show high salt levels in the upper part of the profile similar to the soil samples gathered elsewhere. This could be because the sample site was near two storage docks where salt may have been used. Further sampling of the refuse in Deer Creek Canyon might show other portions of the refuse pile do not have the high salt levels found at site 1. The refuse in Elk Canyon, site 6, does not have the high salt concentrations, but it does have high pH values (9.0) in the upper layers. No acid forming potential was identified in these samples.

Within the MRP's Chapter 3, page 3-65, Table 7, Deer Creek Mine - Waste Rock Analysis, several problems are identified associated with materials taken from roof and floor materials. Data is incomplete since no determinations were made for selenium or for acid base potential. One of the samples had a paste pH value of 5.87 which indicates there could be acid forming potential. One Blind Canyon floor sample apparently had a very high SAR value which indicates that although some areas may meet the Division's criteria, there are probably isolated problem areas.

The Division lacks confidence in the data in Table 7 because some of the SAR values do not correlate with the reported calcium, magnesium, and sodium values. Either some of the SAR values were calculated incorrectly or the sodium, calcium, and magnesium values were not reported correctly.

Tables I and II in Chapter 4 also show some chemical analyses of coal waste with one sample of "slag." The slag sample had a very high pH (10.9), but otherwise, no problems were found in the refuse or slag samples. However, the applicant did not test these samples for several parameters listed in the Division's soils guidelines.

The Division cannot make a determination of waste acceptability because of errors in the data, incomplete data, and because several samples show unacceptable salt, SAR, and pH levels. Errors exist within some of the data in the current plan, and some analyses are incomplete and do not follow the Division's soils guidelines. Furthermore, unacceptable criteria are identified for Blind Canyon floor samples for SAR and pH, and poor criteria are met on Blind Canyon split samples for SAR and on Hiawatha floor samples for pH. Therefore, since data errors exist, data

is incomplete, and roof and floor analyses identify toxicity, the Division cannot make a determination of waste acceptability.

There is some evidence not all of the refuse is toxic to plants. This is discussed further in the reclamation plan section of this analysis.

Findings:

Information in the application is not adequate to meet the requirements of this section of the regulations. Prior to final approval, the applicant must supply the following in accordance with:

R645-301-233.200, The applicant needs to provide chemical and physical analyses of the soil materials proposed for use in reclamation. As an alternative to providing this information immediately, the applicant could include a schedule for sampling, analysis, and appropriate revisions to the mining and reclamation plan.

RECLAMATION PLAN

TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-240.

Analysis:

Soil Redistribution

The amendment states that reclamation will involve three disturbed areas: Deer Creek Canyon, Deer Canyon, and Elk Canyon. The Deer Creek mine site disturbed area will be reclaimed by redistributing soil and spoil by cutting and/or filling the existing mine site footprint. Reclamation will be completed sequencing activities from top to bottom, thus minimizing construction equipment travel over redistributed material. According to the backfilling and grading plan in Section R645-301-553, suitable substitute soil material, either from on site or from a borrow pit, will be separated and temporarily stored in the area of the dismantled truck loadout and storage area. This soil will be used in areas where lesser quality soils exist and/or used as cover over the slope of the refuse pile in Deer Creek Canyon.

Once soil has been distributed, the soiled surface will be roughened by deep gouging (pocking) using a trackhoe to create depressions approximately 3' dia x 1.5' deep. The amendment says these depressions will be developed throughout the reclaimed area and will influence moisture retention and greatly reduce sediment loss.

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Since soil sampling and exploration will be done as part of the operations, the reclamation schedules do not include this activity. Table 3-1, Reclamation Schedule, and Section R645-301-541 General, need to include soil separation and replacement in the reclamation schedule.

The amendment identifies on-site fills as possible substitute topsoil. The exploration program assumes that adequate quantities of substitute soil are available, but gives no estimated volumes and cover depths for the reclaimed site. If suitable soil is not found in the drainage corridor, a designed test plot will be used to test whether the existing spoil material can be used to support vegetation that meets the performance standards. If the test plots do not show that adequate vegetation can be established, suitable soil from a borrow area will be used.

If the results of physical and chemical testing indicate that substitute soil is in the "unacceptable" category according to the soils guidelines, it is unlikely test plots will be successful unless they are managed very intensively. Test plots of this nature would need to be installed very carefully with strict controls to ensure they meet postmining conditions as well as possible.

A more intensive soil exploration and sampling program is likely to yield more valuable data than test plots. It appears from the limited data available that many of the surface materials have been adversely affected by salt applications and that soils at lower levels in the profiles have acceptable chemical characteristics. Although moving the upper layers aside to get acceptable soils from beneath is not as easy as simply grading the surface, it is a far better option than using borrow soils.

At this time, there is simply not enough information in the plan or application about soils or refuse materials to determine how much soil is needed or is available. The surfaces of two portions of the refuse piles are considered unacceptable according to the Division's guidelines and would need to be covered by four feet of growth media, but it is possible other portions of the refuse piles are not as bad. The plan and application contain no information about the quantities of substitute soils that might be available, so it is not known how much soil could be spread over the site. Results of laboratory analyses are essential before these determinations can be made, but the entire reclamation plan, including the backfilling and grading plan, the revegetation plan, and the hydrology plan, is not complete without this information.

Soil Nutrients and Amendments

The biology chapter of the application says fertilizer will be applied at the rate of 40 pounds per acre of ammonium nitrate and 35 pounds per acre of triple superphosphate. The Division encourages operators to use minimal amounts of fertilizer, and these quantities are relatively low.

In addition to the fertilizer, the applicant commits to apply one ton per acre of certified noxious weed free hay, and the hay and fertilizer will be incorporated into the soil in the gouging

process. This should help to increase the amount of organic matter and the fertility and structure of the substitute topsoil.

Soil Stabilization

After topsoil distribution, the biology chapter says certified noxious weed free alfalfa hay will be applied at the rate of 2000 pounds per acre. This and the fertilizer will be incorporated into the soil by deep gouging. Deep gouging creates depressions across the surface which increases water harvesting and helps reduce surface erosion. In addition, rock litter consisting of various sized rocks and boulders will be randomly placed on the slopes and/or nested into the soil to help control slope slippage. On slopes greater than 20%, a soil tackifier will be used to help stabilize surface soils.

It is not clear how the soil tackifier would be used or what type of product would be applied. For example, would this tackifier be applied before or after seeding? Is it a tackifier similar to what is used with hydromulch, or is it one of the commercially available soil stabilizers? This needs to be clarified so the Division can be certain this technique does not conflict with seeding.

After seeding, the biology section R645-301-341, Revegetation, says certified noxious weed free straw mulch will be applied at a rate of 2000 pounds per acre followed by application of 500 lbs/ac of tackifier to anchor the straw mulch and stabilize the soil. This mulching technique has worked very well at similar nearby mine sites.

Rills and gullies which develop to a depth of nine inches or greater in areas that have been re-graded and topsoiled and which either; (1) disrupt the approved post-mining land use or the reestablishment of the vegetative cover, or (2) cause or contribute to the violation of water quality standards for receiving streams will be filled, regraded, or otherwise stabilized. The topsoil will be replaced and the areas will be reseeded.

Refuse Pile Reclamation

The application says the refuse samples were taken to determine if the refuse is acid or toxic or can be used as a suitable soil substitute. It is not clear from the application whether the applicant desires to use refuse as a substitute topsoil or as a subsoil closer than four feet to the surface. Although there is some vegetation growing on the refuse piles, the available chemical analyses indicate the material is not suitable as a growth medium. Future sampling could show that some of the refuse could be used as a subsoil, but the applicant would need to demonstrate its suitability.

Evidence that some of the refuse may not be toxic is in the vegetation currently growing on part of the refuse pile in Deer Creek Canyon. Sampling of vegetation established on portions of the refuse pile for interim erosion control indicates the refuse can, at least in some areas,

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support vegetation. In 1998, vegetation cover on the refuse pile was measured by the applicant's consultant as 40.5%, and in 1999, vegetation cover on the pinyon-juniper reference area was roughly estimated as about 40%. While this seems to indicate the refuse can, by itself, support adequate vegetation, there is no vegetation established on the area of the refuse pile where the high salt concentrations were found near the surface.

If the applicant can adequately identify and isolate those areas of the refuse where toxicity problems are located, it may be possible to use part of the refuse as a subsoil substitute. Refuse with unacceptable chemical or physical characteristics would need to be segregated and buried under at least four feet of non-toxic, non-acid forming, and noncombustible material. Until there is a complete demonstration that the refuse is suitable as a substitute topsoil, however, the Division must assume the worst case scenario which is that the entire refuse pile will need to be covered with four feet of soil material.

Findings:

Information in the application is not adequate to meet the requirements of this section of the regulations. Prior to final approval, the applicant must supply the following in accordance with:

R645-301-341.100, Reclamation schedules in the application need to include soil separation and replacement.

R645-301-241, The application needs to give estimated volumes and cover depths for soils over the reclaimed site. At this time, there is not enough information in the plan or application about soils or refuse materials to determine how much soil is needed or is available.

R645-301-244, The application says a soil tackifier will be used on slopes greater than 20% to help stabilize surface soils. The application needs to clarify how the soil tackifier would be used and what type of product would be applied.

R645-301-233, The application says the refuse samples were taken to determine if the refuse is acid or toxic or can be used as a soil substitute. The applicant needs to clarify this statement. If the applicant intends to use the refuse as a substitute subsoil or topsoil, the Division needs to have more information about its chemical and physical properties and whether it will support vegetation that meets the performance standards. Until further sampling and data are supplied, the worst case scenario must be assumed and the refuse piles and coal mine waste be covered with a minimum of four feet of the best available, nontoxic and noncombustible material.

REVEGETATION

Regulatory Reference: 30 CFR Sec. 785.18, 817.111, 817.113, 817.114, 817.116; R645-301-244, -301-353, -301-354, -301-355, -301-356, -302-280, -302-281, -302-282, -302-283, -302-284.

Analysis:

Timing

Table 3-1 shows the timing of various steps in reclamation, and Table 3-2 is a schedule of monitoring activities. The reclamation timetable does not show months in which the activities would occur, but a note below the table discusses the timing of seeding and planting more specifically. Advantageously, seeding will occur in the fall, but if recontouring is completed in the spring on the upper portions of the disturbed area, seeding will follow. Tree and shrub plantings will occur in early spring.

The seeding and planting schedule is acceptable, but the applicant should attempt to seed as much of the area as possible in the fall. Grading cannot usually begin in the spring until the ground has dried to some degree, and by this time, seeding would be very risky.

Although spring is recognized as a good time to plant seedlings, other operators have had good success planting containerized stock in the fall, particularly at mid- or higher elevation sites that are likely to have some snow cover for much of the winter. Snow cover reduces frost heaving.

The application is not required to have a revegetation monitoring schedule, but the schedule shown should be adequate for showing revegetation success for bond release.

Table 3-1 does not include topsoil salvaging or redistribution. This is discussed in the section of this review covering the reclamation plan for topsoil and subsoil.

Mulching, Seeding, and Other Soil Stabilization Practices

The section of this review addressing the reclamation plan for soils and subsoils discusses soil preparation techniques.

Seed and planting mixes

The applicant has revised the three seed mixes in the mining and reclamation plan and has followed Division recommendations. Many of the species have been tried at interim revegetation sites at the mine, and the recommendations were partly based on the successes at those sites. Every species in the mixtures is native to the area, and the mixtures are diverse and should lead to vegetation stands that comply with the revegetation performance standards.

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Drawing DS-1797-D shows which seed/planting mixes will be planted in which areas of the mine. The riparian seed mixture will be applied to the area within 20 feet either side of the channels. The conifer seed mixture will be applied to north-facing slopes, and the pinyon-juniper seed mixture will be applied on south-facing slopes.

The applicant is required by R645-301-358.400 to enhance where practicable, restore, or replace, wetlands and riparian vegetation along rivers and streams and bordering ponds and lakes. Since these areas are considered habitat of unusually high value, the applicant needs to use the best technology currently available to achieve these goals. Deer Creek above and below the mine supports a riparian community that needs to be restored as far as possible. The seed and planting mix contains many of the species assumed to have been in the riparian area before disturbance as shown in Table 6, page 2-156, of the current mining and reclamation plan. Many of the species in the seed and planting mix are upland species, but there are other species in the mix that would grow strictly in areas with enhanced moisture availability.

In Section R645-301-342, the application says channel design will incorporate soft bioengineering in slope areas of less than 5% along the Deer and Elk Creek drainages. Instead of riprap, alternative instream controls, such as wing deflectors, boulder clusters, and "U" or "V" shaped weirs, will be used. Locations where these techniques will be used are shown on Drawing DS-1780-D, and specific designs are in Figures 7-1A and 7-2A.

While the seed and planting mixtures are acceptable, the applicant needs to put additional emphasis on planting certain parts of the bioengineered channels. The areas behind logs and root wads are where erosion and scouring are likely to occur, and the applicant needs to be able to stabilize these areas. Possible options include:

1. Planting additional willows (coyote willow) in these areas. Willows could be planted very densely, or the applicant could consider putting willow wattles in these areas.
2. Planting plugs of sedges and grasses in these areas. This could be done in combination with willow wattles. The sedges and grasses would be planted behind the wattles. Inventories of the riparian vegetation do not show any sedges occurring along the stream, but it might be possible to establish beaked or wooly sedges. Grasses most likely to help stabilize the bank are Kentucky bluegrass (already in the seed mix), redtop, and tufted hairgrass. Tufted hairgrass and redtop could be planted from seed, but redtop plugs could be obtained either from adjacent areas or commercial nurseries.

Additional discussion of the soft armoring is in the hydrology section of this review.

Seeding and mulching methods

Seed will be applied with a hurricane spreader or using a hydroseeder. If a hydroseeder is used, a small amount of wood fiber mulch will be added to mark the coverage area during application. These are standard seeding methods and are acceptable.

After seeding, certified noxious weed free straw mulch will be applied at a rate of 2000 pounds per acre followed by application of 500 lbs/ac of tackifier to anchor the straw mulch and stabilize the soil. This mulching technique has worked very well at similar nearby mine sites. The applicant should not use an asphalt-based tackifier.

Two of the seed mixes include some combination of containerized plants, cuttings, rooted cuttings, bare root plants, and poles. In the riparian areas, 25% of each of these would be planted during each of the first four years. This allows some sedimentation and development of suitable planting sites to occur before all the seedlings are planted. In the Division's experience, there are not always enough places to plant along a restored stream during the first year after reclamation.

The concept of not planting all of the transplants at first was suggested by the Division, but the applicant needs to be aware it would lead to a longer extended responsibility period. The success standard for woody plants in the riparian area is 3412 per acre. R645-301-357.311 allows planting trees or shrubs at a rate of up to a cumulative total of 20% of the required stocking rate through 40% of the extended responsibility period without restarting the extended responsibility period. Therefore, up to 682 trees or shrubs per acre could be planted for the first four years after the initial planting without affecting the extended responsibility period. According to the application, however, about 1014 per acre would be planted each of the first four years for a total of about 3042. This, of course, is much greater than 682.

Maintenance and monitoring

The application does not discuss irrigation, so it is assumed the reclaimed area will not be irrigated. Rodent control measures will be implemented as necessary. Weed control will not be done unless it is necessary, but all noxious weeds will be eradicated if they become established on the site. The Division does not anticipate that irrigation or pest control will be needed except for noxious weeds. The husbandry practices in R645-301-357 allow control of noxious weeds through the entire extended liability period without affecting the length of this period.

The application says the annual monitoring will include inspection for rills and gullies. If present, they will be filled and the soil reseeded. Rill and gully repair will follow the requirements of rules R645-301-357.360 through R645-301-357.365.

Standards for Success

The plan contains information about three reference areas that will be used as revegetation success standards. It appears from the data and comparisons in the plan that these reference areas are acceptable.

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The application discusses ways of measuring vegetation cover, productivity, and the density of woody plants. It also mentions the statistical tests that will be used, and these methods are acceptable.

The application says revegetation for tree and shrub species will be considered successful when the tree and shrub counts in the reclaimed areas are similar at the time of bond release to the counts in the reference areas. Standards attained at the time of bond release will be approved by the Division and the Division of Wildlife Resources (DWR).

The Revised Universal Soil Loss Equation (RUSLE) will be used to model sediment loss from disturbed and reclaimed areas, and sedimentation will be monitored above and below the mine. While there are problems with every method developed for measuring erosion, those discussed in the application are acceptable.

At the time of bond release or when the extended period for successful revegetation has passed, one of the similarity indexes in Appendix B of the Division's "Vegetation Information Guidelines" will be used to compare life forms and/or species present in the reclaimed and reference areas.

The Division has found in comparing diversity between reclaimed and reference areas that diversity and similarity indexes are useful but that they do not always take enough factors into account. It is impossible with many to use a statistical test, so if the standard is not met, there is no alternative but to say the site does not meet bond release criteria.

The best method at this time appears to be to use a few indexes in combination with a qualitative evaluation of the vegetation diversity. Even with this combination of methods, though, the plan needs to contain a standard. Appendix B of the "Vegetation Information Guidelines," referenced in the application, says that *proposed* disturbed and reference areas can be considered adequately similar if the index value is at least 70%. This would be an acceptable standard for comparing life forms between the reclaimed and reference areas, but it should not be used to make comparisons of species.

Seasonality of established plant species is an important issue at some mines, but most or all of the species encountered in the vegetation sampling at Deer Creek were cool season species. These are generally much easier to establish than warm season species, so seasonality should not be a concern. To achieve revegetation success, essentially all of the species in the reclaimed area should be cool-season.

The other requirements in R645-301-353 would be very difficult to measure quantitatively, so a qualitative analysis at the time the applicant is seeking bond release is most appropriate.

Field Trials

The application includes no specific proposal for field trials, but field trials could be

needed depending on the results of sampling refuse and substitute soils.

At this time, the Division cannot make a finding that revegetation is feasible using the proposed reclamation plan. The applicant has not presented a definitive soils reclamation plan. The applicant has committed to take soil samples during the operations phase and is being required to commit to a schedule for taking these samples. The application does contain analysis results for some soils and refuse, but, as discussed in the technical analysis for soils, there are problems with some of these materials and with incomplete and unreliable results. The Division does not know how much substitute soil will be available for reclamation or how much soil is needed.

It is vital that there be adequate suitable soils for revegetation. Most perennial species in Utah have relatively deep roots so they can extract water from increasing depths as the summer progresses. If root growth is inhibited by poor chemical or physical characteristics or if the soil has low water holding capacity, vegetative cover, production, diversity, and erosion control will all suffer.

Fish and Wildlife Habitat

The seed mixture in the application are acceptable for providing proper habitat conditions for wildlife.

According to the application, development of enhanced wildlife habitat is accomplished by constructing pools along portions of the Deer Creek drainage, and pools will be placed at the confluences of the drainages from Deer and Elk Canyons with Deer Creek.

No other enhancement measures are discussed in this section of the application, but the application says rocks and boulders would be placed on the surface. This enhancement method has been used successfully at other mines to create habitat for birds and small mammals.

The application discusses possible water discharge from the portal after reclamation. In the July 7, 1999, technical analysis, the Division required a program to study the effects of the discharge on macroinvertebrate populations in Deer Creek and Huntington Creek. The applicant responded in the cover letter that it believes there is no justification to perform a macroinvertebrate study before or after reclamation.

Volume 9A of the current mining and reclamation plan contains a report from the Ecosystem Research Institute about the water quality and macroinvertebrate studies done in Deer and Huntington Creeks in 1990, 1991, 1992, and 1994. The report concludes the water discharge from the Deer Creek mine had no measurable effects on the macroinvertebrate populations of Huntington Creek. However, it did affect Deer Creek.

Water from the mine had a pH of near 7, but as CO₂ was lost from the water, the pH increased to about 8.5 and calcium carbonate precipitated. The report estimates that 250,000 kg of calcium carbonate was deposited as limestone in Deer Creek over a three year period. The

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report concludes that this rate of precipitation would "seal the stream bottom and thus prevent accrual of stream water into the adjacent riparian community." It also says this precipitation would decrease the amount of macroinvertebrate colonization in Deer Creek. This could be through alteration of the substrate or direct effects on the macroinvertebrates as observed in the stonefly study.

The Division contacted DWR about this issue, and they are primarily concerned about any effects on Huntington Creek rather than Deer Creek. They do not feel the effects on Deer Creek are of enough significance to warrant further monitoring of the macroinvertebrate populations. Therefore, while there have been and probably will continue to be effects on the macroinvertebrate populations of Deer Creek, these are not significant enough to require further monitoring.

After the mine is reclaimed, there will, presumably, continue to be some discharge from the mine and calcium carbonate precipitation; however, most should occur near the disturbed area with less happening farther down the canyon. The report in the plan discusses the sealing effect the calcium carbonate had on the streambed and that it decreased infiltration into the soil. This could continue to occur after reclamation, but the area most likely to be affected would be the reclaimed area. As the report in the plan says, there were, unexpectedly, no effects of the water discharge on the riparian vegetation. The increased water should have had some effects on the vegetation composition and cover, but limestone precipitation apparently sealed the stream bottom to the point there were no measurable effects. When the mine water discharge is eliminated or greatly reduced, the effects of sealing the creek bottom will remain, so the amount of water available to riparian vegetation could be decreased compared to premining levels.

Findings:

Information in the application is not adequate to meet the requirements of this section of the regulations. Prior to final approval, the applicant must supply the following in accordance with:

R645-301-341.210, The applicant needs to place greater emphasis on planting certain portions of the bioengineered channel, such as behind logs and root wads. The applicant needs to ensure these areas are stable. Possible methods include dense willow plantings, willow wattles, and combinations of willows with grasses and/or sedges.

R645-301-341.250, The application includes a method of measuring diversity, but it needs to give a success standard.

LAND USE RECLAMATION PLAN

Analysis:

According to Section 412 of the application, the postmining land uses will be grazing and wildlife habitat, and these are the same as the premining land uses. Both the Forest Service and Bureau of Land Management have indicated no foreseeable changes to this use, and the area is zoned by the county for grazing, mining, and recreation.

Findings:

Information provided in the proposal is considered adequate to meet the requirements of this section of the regulations.

RECOMMENDATIONS:

The application should not be approved until the deficiencies discussed in this memorandum have been adequately addressed.